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OBSERVATIONS ON THE INCIDENCE OF INTESTINAL SPIROCHETES IN THE PHILIPPINE ISLANDS

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Nearly two years ago our attention was attracted by the presence of spirochetes in the feces of several patients under examination, and it was decided to make a systematic search for them in a series of cases of intestinal endamebiasis. One of the ideas in our minds at the time was that spirochetes in association with endamebae might cause lesions which respond to treatment with salvarsan. It is recognized that some cases of intestinal endamebiasis which are refractory to other forms of treatment do respond to the treatment with salvarsan, and it was thought that this might furnish an explanation.

Spirochetes have been found in the feces of dysenteric and nondysenteric cases by several observers since 1880. Among these observers are Kowalski,[1] Escherich,[2] Lustig and Giaxa,[3] Gruber,[3] Babes,[3] Fürbringer,[4] Kirchner,[3] Abel,[5] Aufrecht,[6] Rechtsamer,[7] Günther,[8] Le Dantec,[9] Löwenthal,[10] Mühlens,[11] Rosanow,[12] Werner,[13] Courmont and Lesieur,[14] Leber and v. Prowazek,[15] Camermeyer,[16] J. G. and D. Thomson,[17] Fantham and Porter,[18] Fantham,[19] Macfie,[20] and Carter.[21]

Since the beginning of our work several reports on the occurrence of intestinal spirochetes have appeared, prominent among these being the works of Fantham, Macfie, and Carter.

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[1] Centralbl. f. Bakteriol., 1, 1894, 16, p. 321. Wien. klin. Wchnschr., 1893, 6, p. 888.

[2] Münch. ärztl. Intell.-Blatt., 1884, 51. Centralbl. f. Bakteriol., 1, 1894, 15, p. 408.

[3] Wien. med. Wchnschr., 1886, 36, pp. 342, 383, 423. Centralbl. f. Bakteriol., 1, 1894, 15, p. 721.

[4] Deutsch. med. Wchnschr., 1892, 18, p. 768.

[5] Centralbl. f. Bakteriol., 1, 1894, 15, p. 213.

[6] Ibid., p. 405.

[7] Ibid., p. 795.

[8] Einführung in das Studium der Bakteriologie, 1898.

[9] Comp. rend. Soc. de biol., 1903, 55, p. 617.

[10] Berl. klin. Wchnschr., 1906, 43, p. 283.

[11] Ztschr. f. Hyg. u. Infectionskrankh., 1907, 57, p. 405.

[12] Russk. Vrach., 1909, No. 10.

[13] Centralbl. f. Bakteriol., I, O., 1909, 52, p. 241.

[14] Lyon Méd., 1911, p. 19.

[15] Arch. f. Schiffs-u. Tropen-Hyg., 1911, 13, p. 421.

[16] Arch. f. Schiffs-u. Tropen-Hyg., 1912, 16, p. 84.

[17] Proc. Roy. Soc. Med., 1914, 7, p. 45.

[18] Proc. Cambridge Phil. Soc., 1915, 18, p. 184.

[19] Brit. Med. Jour., 1916, 1, p. 815.

[20] Ann. Trop. Med. and Parasit., 1917, 10, p. 391.

[21] Lancet, 1917, 192, p. 336.

Fantham found them with great frequence, and concerning their identity says: "It is probable that the earlier authors . . . were dealing with the same spirochaete, which exhibited morphological variation due to the processes of growth and division. The first name proposed by Werner, namely, *S. eurygyrata,* will then be valid. It is therefore necessary to amend the definition of the organism as follows: *Spirochaeta eurygyrata* has tapering ends, measures up to 15 microns long and is about 0.25 micron broad. It contains a diffuse nucleus consisting of chromatinic granules. The number of coils or waves is variable, depending on the rate of movement and thickness of the organism.

"*Spirochaeta eurygyrata,* Werner, emend. Fantham, may occur in the stools of dysenteric and apparently healthy persons. The organism, which has pointed ends, measures from 3 microns to 15 microns in length by about 0.25 micron in breadth.

"The so-called spirilla, mentioned by some of the earlier workers as occurring occasionally in cholera motions, are included under the name *Spirochaeta eurygyrata.*

"The number of coils in a spirochaeta is not a specific character but is variable, and is primarily an index of its rate of motion, being also partly dependent on the thickness of the organism."

Macfie studied this question in Africa and came to the following conclusions:

"*Spirochaeta eurygyrata* Werner, emend. Fantham, is well nigh an invariable inhabitant of the human intestine at Accra, on the Gold Coast, West Africa.

"Similar, if not identical, organisms are found also in the intestines of various animals.

"As a rule, the spirochaetes appear to be nonpathogenic—that is to say, their presence is not incompatible with a normal state of health, but under certain conditions they multiply so enormously that it is difficult to believe that they can be entirely benign."

Carter in the Liverpool School of Tropical Medicine studied smears from the stools of 554 patients admitted into hospital for dysentery or related diseases, and of these 313, or 56.5%, showed spirochetes. Some of his cases were examined more than once and "latent positives" were thus found. Computing from the number thus found he thinks that the number of "positives" should be raised to 346, or 62.4%. He also examined for spirochetes 100 nondysenteric patients, suffering from nonintestinal diseases, and 41% were shown to be infected. Here he thinks an appreciable number of "latent positives" were included among the "negatives." In view of his results he concludes that spirochetal infections of the alimentary canal are almost, if not quite, as prevalent in nondysenteric as in dysenteric patients. He found spirochetal infections frequently mixed with single or multiple protozoal infections of the alimentary tract, but concludes that there would appear to be no correlation between the presence of these organisms and the occurrence of any of the commoner protozoa in the stools.

Wolbach[22] has reported a spirochete from human feces which he recovered in pure culture after passage through a Berkefeld filter. This spirochete he was able to cultivate in slightly acid meat-infusion-broth. He has also cultivated it on agar-agar. We are unable to determine at the present time if the organism seen by us in Manila is identical with that described by Wolbach.

Many of the earlier workers found the spirochetes in association with the cholera vibrio and some suggested that the spirochetes found an especially good medium for growth in the cholera intestine. In the light of the more recent work on the subject, it appears to us that the fact that so many of the earlier workers found intestinal spirochetes in cholera cases is accounted for by the fact that it has been during cholera epidemics that the largest number of examinations of feces have been made. Among the places from which these intestinal spirochetes have been found are England, Trieste, Bordeaux, Belgian Congo, German S. W. Africa, Gold Coast, Berlin, Hamburg, Magdeburg, Greifswald, Gallipoli, Flanders, Caucasus, Tonkin, Samoa, and to this list we add the Philippine Islands.

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[22] Amer. Jour. Trop. Dis. and Prev. Med., 1915, 2, p. 494.

The results of our own work on this subject are reported in order to add to the knowledge of the geographic distribution of intestinal spirochetosis, and to give what data we now have, in case this condition should later assume a significance which is not attributed to it at the present time.

For the purpose of making a study of this spirochete, a series of 50 stools was obtained from the laboratory of clinical pathology at the Philippine General Hospital, the intention mainly being to determine the incidence of the infection and develop a line of attack on the problem in general.

In many cases the specimens were not received at the laboratory until many hours had elapsed after they had been passed. These specimens, as might be expected, did not offer the best material on which to make a differential diagnosis between the various endamebae. Therefore, no attempt was made to diagnose species and the various endamebae found were simply recorded under the generic name. No difficulty was experienced in determining the identity of trichomonas or the various eggs of helminths which were found from time to time.

The material was first examined fresh, and in the case of formed stools a little physiologic sodium chlorid solution was used to emulsify the feces. Two permanent preparations were made from each stool and all smears were fixed wet, either in Bouin's picro-aceto-formol solution, or sublimate-acetic fluid. Staining was done by the Heidenhain iron-hematoxylin method or with Delafield's hematoxylin, or the modified Delafield solution made according to the formula of one of us.[23] All three stains gave a clear demonstration of the spirochete, and, indeed, this spirochete seems particularly amenable to treatment by the standard cytological methods. The best demonstration of the chromatinic granules was obtained by treatment with the modified Delafield solution.

In the larger proportion of cases, that is to say, the forms measuring 4 microns or more, there was little difficulty in observing the living spirochetes in the fresh preparations, by direct illumination. In a number of cases, however, the preparation was swarming with bacilli 4-6 microns in length, and some care was necessary to distinguish them from spirochetes. Sometimes the appearances in the stained preparations gave rise to the same doubt, especially if the bacillus had become bent or twisted in making the film. Such forms were carefully

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[23] Shumway: Jour. Exper. Zool., 1917, 22, 532.

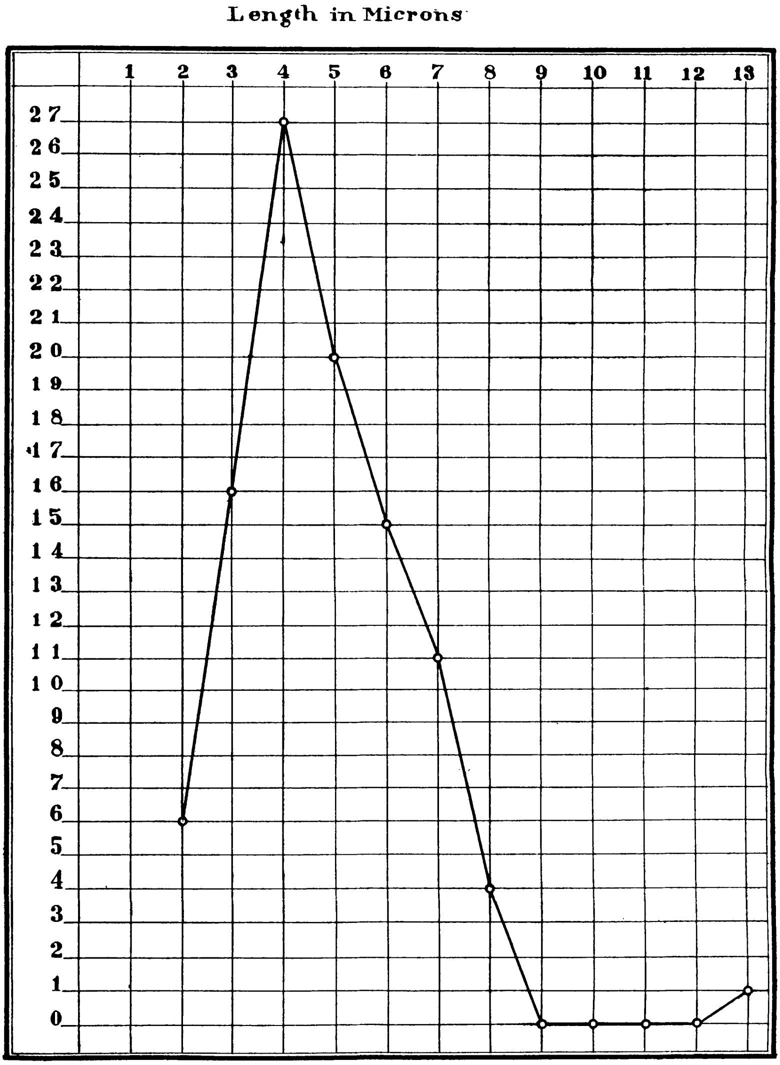

Chart 1. Measurements of 100 intestinal spirochetes.

excluded and a positive diagnosis of spirochetes was made only on the presence of forms which were unmistakably spirochetes.

Measurements were made of 100 individuals selected at random from various stained preparations. The method of Stephens was used, and the measurements were made under a magnification of about 1,400 diameters. The results have been plotted and are shown on Chart I. It will be seen that the range in size is from 2 microns up to 8 microns, but that a single individual measured 13 microns. This latter bore every appearance of being a dividing individual; it was partly incurved and showed a distinct thinning at the middle, and suggests an explanation for the presence of a flagellum-like body seen at one extremity of two individuals.

Fifty stools were examined in the series, representing 46 separate hospital cases. Of these cases, thirty-five (73%) were positive for spirochetes. There were seventeen cases (48%) which showed a concomitant infection with endameba, and scattered infections with Trichomonas intestinalis and the more common helminths.

The patients from whom these stools were obtained were undergoing treatment for various ailments. Of the 35 which were positive for spirochetes, 10 patients were receiving treatment for endamebic dysentery.

Unfortunately, in the greater proportion of cases, it was not possible to examine more than one stool of a given patient. In 4 cases, however, two stools were received. In 2 of these cases, one examination was positive and the other negative. In the other 2 cases, each examination yielded positive results.